

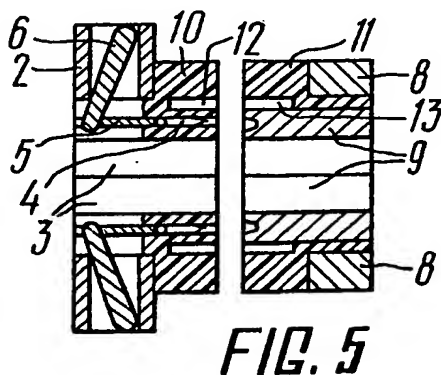
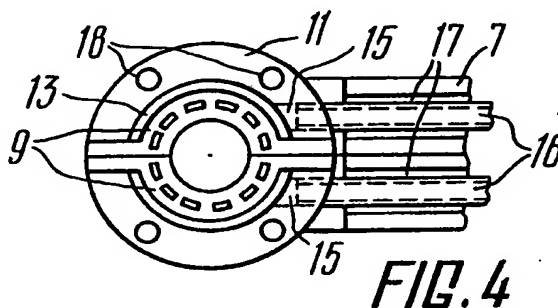
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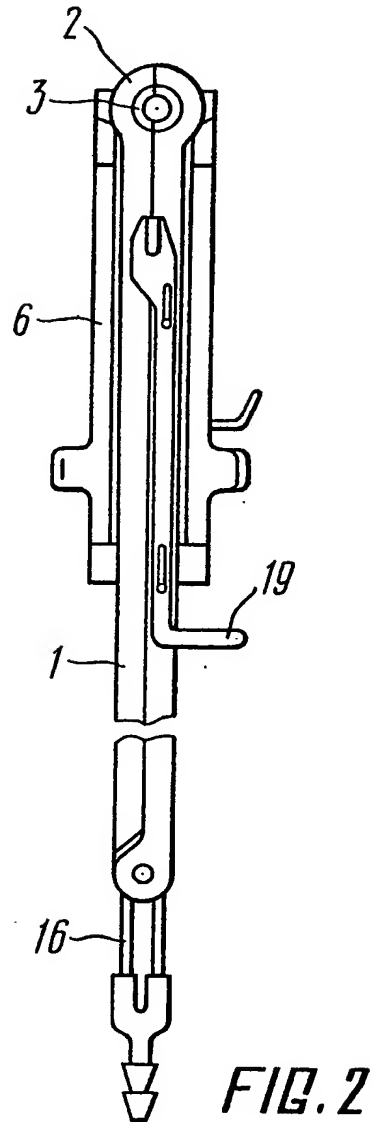
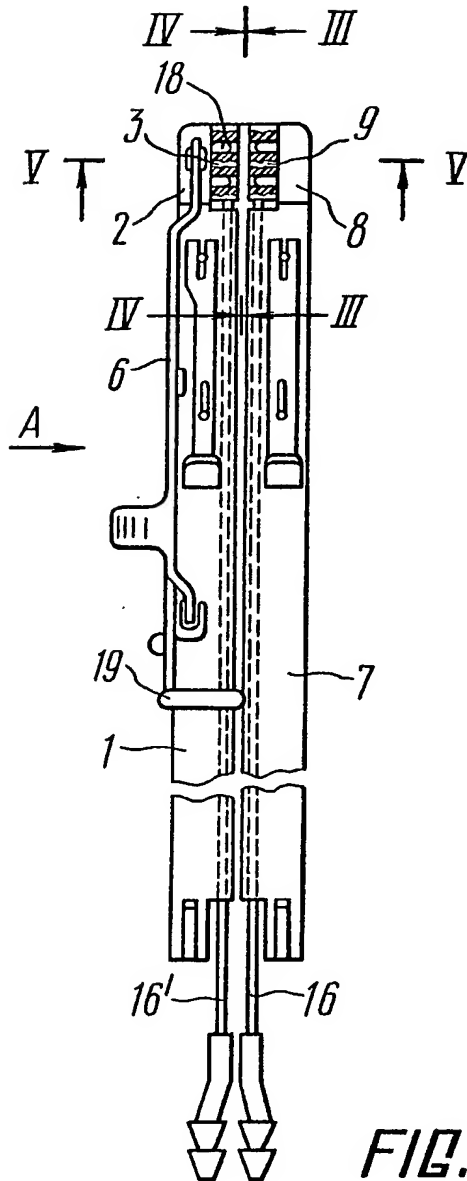
(54) Stapler for vascular anastomoses

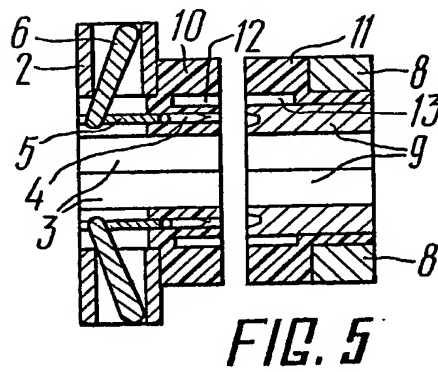
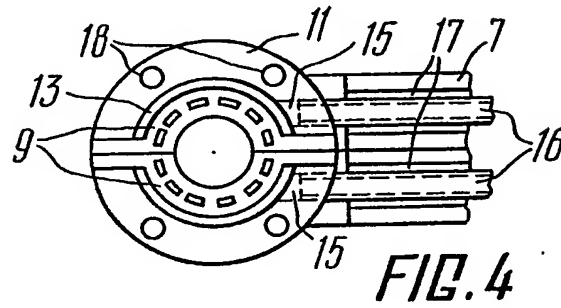
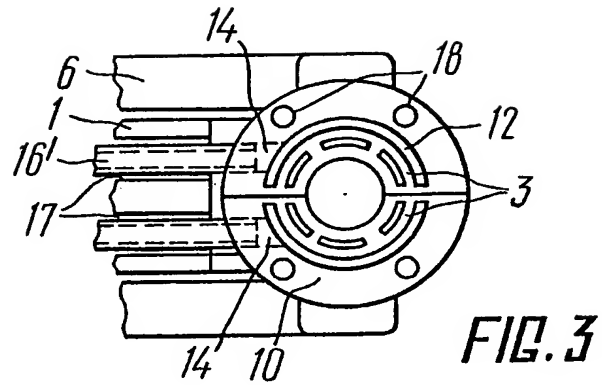
(57) The instrument has a separable body composed of two oblong interlinked members (1 and 7), each of them carrying at one of its vacant ends a detachable split bush (3 and 9) adapted for the element being sutured to pass

through the interior thereof and arranged across the longitudinal axis of the respective instrument body member. The bushes (3 and 9) have flanges (10 and 11) on the ends facing each other, each of said flanges having an open annular slot (12 and 13) in the surfaces facing each other, and an opening (14 and 15) made in the lateral face of the flange, said opening being communicated with the slot and with the tube (16 and 16') that freely runs throughout the overall length of the instrument body and extends from it outwards so as to be connected to the vacuum device. Said slots (12 and 13) and openings (14 and 15) in the bushes establish, along with the tubes (16 and 16'), a system of air evacuation from the suturing zone, which is discarded along with the bush after the suturing procedure. One of the bushes has passages for the staples, while the other bush, a die for the staples to bend. A staple feeding mechanism is also provided.



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## SPECIFICATION

## Instrument for establishing vascular anastomoses

5 The present invention relates to medical equipment and more specifically to a surgical instrument for establishing vascular anastomoses with the use of metallic staples, e.g., for circular suturing of blood vessels.

10 The invention resides in that in an instrument for establishing vascular anastomoses, comprising a separable body composed of two oblong interlinked members, each carrying at one of its ends a removable split bush adapted for passing the element being sutured through its interior and arranged across the longitudinal axis of the respective member of the body, a system of ducts for air evacuation from the suturing zone so as to define a negative pressure therein, that retains the elements being sutured in the everted position, a mechanism for feeding the staples through one of the bushes and a die for the staples to bend on the other bush, as well as a vacuum device communicated with the system of air evacuation ducts, according to the present invention, the bushes have flanges provided on the ends facing each other, each of said flanges having an open annular slot in their surfaces facing each other, and an opening is made in the face of each flange, said opening being communicated with said annular slot and with a tube freely passing throughout the overall length of the instrument body of the components thereof and extending from the instrument body outwards so as to be connected to the vacuum device, with the result that the slots and openings in the bushes form, along with the tubes, a system of air evacuation from the suturing zone, which can be discarded complete with the bush after the suturing procedure.

40 Provision of flanges on the bush ends facing each other makes it possible to define open annular slots therein and communicate said slots, via the side openings, with the tubes connected to the vacuum device, thus forming an air evacuation system. The bushes along with the air evacuation system are in effect single-use discardable components, which in turn contributes to guaranteed sterile conditions and renders the instrument rapidly reapplicable.

50 In one of the embodiments of the present invention the instrument body is provided with locating rods, while the flanges of the bushes have mating sockets adapted for an accurate positioning of the bushes in the instrument body, thereby providing for rapid and reliable locking of the bushes and the air evacuation system in the instrument.

55 In what follows the present invention will become more apparent in a description of a specific embodiment of an instrument for establishing vascular anastomoses, according to the invention, as a non-limiting illustrative example, to be considered with reference to the appended drawings, wherein:

60 *Figure 1* is a general, partly sectional view of an instrument, according to the present invention;  
*Figure 2* is a side elevation view facing an arrow A in *Figure 1*;  
*Figure 3* is a section taken on the line III-III in *Figure*

1;

*Figure 4* is a section taken on the line IV-IV in *Figure 1*; and

*Figure 5* is a section taken on the line V-V in *Figure*

70 1.

An instrument of the invention is of a separable construction, composed of two members, i.e. a staple body 1 comprising two halves with semirings 2 (*Figures 1, 2*) and termed so because its semirings 2 carry a split staple bush 3 with staples 4 and ejectors 5 of the staples 4 (*Figures 1, 5*). The staple body 1 mounts also a mechanism for feeding the staples 4, provided with levers 6 (*Figures 2, 3, 5*). The other member of the instrument is a supporting body 7, comprising two halves with semirings 8 (*Figures 1, 4*) and termed so because its semirings 8 carry a split supporting bush 9 with a die for bending the staples 4. Upon having been ejected from the staple bush 3 the staples 4 thrust against the die of the split supporting bush 9 with their legs which are thus bent into the shape of the letter B to unite the tissues being sutured. The split staple bush 3 and supporting bush 9 have respective flanges 10 and 11 on the bush ends facing each other. The flange 10 of the staple bush 3 has an open annular slot 12 having a radius somewhat in excess of the radius of the slots for the staples 4, while the flange 11 of the supporting bush 9 has an open annular slot 13 with a radius somewhat in excess of the radius of recesses in the die of the supporting bush 9. The lateral faces of the flanges 10 and 11 have respective openings 14 and 15 communicated with the respective open annular slots 12 and 13. Tubes 16 and 16' (*Figures 3, 4, 5*) are connected to said respective openings 14 and 15, said tubes being laid in slots 17 along the halves of the staple body 1 and supporting body 7 and are connected with their opposite ends extending from the bodies 1 and 7 outwards, to the vacuum device (not shown). In order to provide fast, accurate and reliable locking of the staple bush 3 and supporting bush 9 in position, locating rods 18 are made on the semirings 2 and 8, while the flanges 10 and 11 have respective sockets (*Figures 1, 3, 4*). A lock 19 (*Figures 1, 2*) is provided to join the supporting body 1 and the supporting body 7 together.

Now let us consider the operation of the instrument for establishing vascular anastomoses, according to the present invention.

115 Prior to starting operation one must open the package and take out the staple bush 3 and the supporting bush 9, both being in completely sterile condition, along with the tubes 16 and 16' mounted therein, the staple bush 3 being loaded with the staples 4 and provided with the ejectors 5 of the staples 4, fitted therein.

120 The the staple bush 3 is put onto the rods 18 of the semirings 2 in the staple body 1, and the tubes 16, 16' are laid in the slots 17 and connected to the vacuum device. The supporting bush 9 is put onto the rods 18 of the semirings 8 in the supporting body 7, and the respective tubes 16 are laid in the slots 17 of the supporting body 7 and connected to the vacuum device as well. Thus, the instrument is ready for operation.

The blood vessels to be united by suturing are passed through the bores of the bushes 3 and 9 by, say, setting apart the halves of the staple body 1, placing the vessel into the interior space of the bush 3 and bringing said halves together and locking them to each other, so that the vessel end should extend 3 to 4 mm from the flange 10 of the bush 3. Using the same techniques the other vessel is passed through the bore of the supporting bush 9 of the supporting body 7. The the extending vessel ends are folded back with pincers towards the open annular slots 12 and 13 in the flanges 10 and 11 of the bushes 3 and 9. Folding back of the vessel ends and their approximating the annular slots 12 and 13 are accompanied by vacuum suction, whereby the vessel ends are everted and held to the bushes 3 and 9, intima outwards.

Next the surgeon must join the staple body 1 and the supporting body 7 together through the lock 19, with the result that the vessels are brought in contact with their intima, and the both ends of the sutured vessels are temporarily united. Then one must press the levers 6 of the mechanism for feeding the staples 4, thus actuating the ejectors 5 of the staples 4. As a result, both walls of the juxtaposed vessels fixed in a required position are pierced with the legs of the staples 4, which then get in the recesses of the die of the supporting bush 9 and are bent there into the shape of the letter B, thus stitching the vessel walls. The suturing over, the vacuum device is disconnected, the halves of the staple body 1 and supporting body 7 are set apart, and the instrument is removed from the sutured vessels.

The instrument of the invention for establishing vascular anastomoses is simple in construction and application techniques, is convenient and can be readily mastered by surgeons. It is of paramount importance that the instrument ensures high degree of sterility and quality of suturing operation and enables a number of repeated operations to be performed quickly within the same surgical intervention. In addition, the proposed instrument is much cheaper as compared to the known similar instruments.

#### CLAIMS

1. An instrument for establishing vascular anastomoses with the use of staples, comprising a body composed of two detachably joined oblong members, two split bushes, each of them being detachably mounted at the end of the respective one of the oblong body members, each of said bushes being adapted for one of the vessels being anastomosed to pass through its interior space and being arranged across the longitudinal axis of the respective oblong member at one of the ends thereof, said bushes being adapted, when said oblong body members are joined together, to form the suturing zone, said bushes having flanges on the ends facing each other, which flanges define the suturing zone, a system of ducts for air evacuation from said suturing zone in order to define a negative pressure therein so as to retain the elements being sutured in the everted position on said flanges, said air evacuation

system being formed by annular slots provided in said flanges and opening into the flange surfaces facing each other, an opening made in the lateral face of the flange of each bush, each of said

70 openings being communicated with the tube freely passing throughout the length of the instrument body and of the components thereof and extending from the body outwards; a vacuum device communicated with the tubes extending from the body components, passages in one of said bushes for the suturing staples, a die in the other of said bushes for the staples to bend, a mechanism of feeding the staples for suturing.

2. An instrument as claimed in Claim 1 wherein 80 locating rods are provided in the instrument body, while the flanges of the bushes have mating sockets so as to attain an accurate positioning of the bushes in the body.

3. An instrument for establishing vascular anastomoses, substantially as herein described and 85 illustrated in the accompanying drawings. Figures 1 - 5.

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